



PUBLIC HEALTH ASSESSMENT

VASQUEZ BOULEVARD AND I-70 SITE

DENVER, COLORADO

CERLIS NO. CO

11-1-99

Nov.
MTG

Prepared by:

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U.S. Public Health Service

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Summary

To be added after Section 3 is written

draft

Purpose and Health Issues

Purpose

The purpose of the Agency for Toxic Substances and Disease Registry's (ATSDR) public health assessment process is to evaluate the public health significance of exposure to site-related contaminants and to decide the public health activities that are needed at Superfund sites. Those activities come under several broad categories: an evaluation of the degree of human exposure to contaminants; biological monitoring; health education activities; health promotion activities; recommendations to local, state, and federal agencies; community involvement; and health studies. This public health assessment report describes the activities that ATSDR took at the Vasquez Boulevard and I-70 (VBI70) Site and provides the agency's opinion about the public health significance of contamination at the site.

To investigate this site, ATSDR established the VBI70 health team, hereafter referred to as the health team. The health team met regularly to discuss public health issues related to the VBI70 site. Input from members of the health team was invaluable to ATSDR in evaluating chemical exposures and in deciding the appropriate public health activities for the site.

Listed below are the health team members:

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Swansea neighborhood, Executive Director, Cross
Community Coalition, Denver

ATSDR, Atlanta

Clayton neighborhood, Denver

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ATSDR, Denver

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Colorado Department of Public Health and
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Clayton neighborhood, Denver

U.S. Environmental Protection Agency, Denver

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Public Health Issues

During its investigation of the VBI70 site, ATSDR and the health team identified the following public health issues:

1. Is arsenic contamination in soil a threat to the public's health?
2. Is lead contamination in soil a threat to the public's health?
3. Is exposure to other chemicals in the environment a threat to the public's health?
4. Are communities of color at increased risk of harmful effects from lead and arsenic exposure?

Background

Introduction to the Site

The VBI70 study area is in northeast Denver (see Figure 1) and consists of the NPL site and an expanded study area (see Figure 2).¹ The U.S. Environmental Protection Agency (EPA) proposed the site to the National Priorities List on January 19, 1999, thus requiring ATSDR to conduct a public health assessment of the site by January 19, 2000. The study area is bounded on the west by the South Platte River and is approximately bounded on the east by Colorado and Vasquez Boulevards. Northern boundaries include the 49th, 50th, and 52nd Avenues while the southern boundaries are mostly Martin Luther King Avenue. A small area south of Globeville is also included. Its boundaries are Interstate 70 on the north, 35th Avenue on the south, Huron Street to the west, the South Platte River on the east, and the Burlington Northern Railroad on the southeast.

The neighborhood boundaries in the study area are shown in Figure 2 and consist of all or portions of five neighborhoods: Elyria, Swansea, Cole, Clayton, and the southern part of Globeville. The study area consists of a mix of residential, commercial, and industrial areas. Businesses located in the neighborhoods include bakeries, manufacturing facilities, large and small volume printers, metal working shops, auto body and truck repair shops, and a major electric utility power plant. The area also is home to 38 diesel truck fleets (greater than 9 trucks per fleet), with over 4,800 trucks. Truck fleets with fewer than 9 vehicles also exist in the study area,

¹ The boundaries for the NPL site and the study area are approximated based on maps provided to ATSDR by the U.S. Environmental Protection Agency.

but they are not required to register with the state. Interstate 70, the main east-west thoroughfare in Denver, bisects the site and has over 781 million vehicle miles traveled per year.

Several other hazardous waste sites or facilities are located in or near the VBI70 site: ASARCO Globe Plant, Sand Creek, Chemical Sales, Broderick Wood Processing, Koppers, and the Rocky Mountain Arsenal, to name a few.

Site History

The Omaha & Grant smelter and the Argo smelter once operated in this area of Denver (see Figure 1.) Between 1883 and 1902, the Omaha & Grant smelter processed 2,200,000 tons of ore producing gold, silver, copper, and lead. In 1899, the Omaha & Grant smelter became part of the American Smelting and Refining Company (ASARCO), which continued to operate the plant until it closed in the latter part of 1902. The smelter was demolished in the 1950's and is now covered with concrete, asphalt, and the Denver Coliseum. The Argo smelter operated from 1876 until 1908 smelting gold and silver before switching to lead and copper (Colorado Department of Public Health and the Environment, Site Inspection Report, and ATSDR, PHA for Asarco Globe Plant, 1995.)

The ASARCO Globe smelter produced gold, silver, lead, and copper in 1886. ASARCO acquired the facility in 1898 and converted the facility to a lead smelter in 1901. In 1911, the facility began roasting arsenic from baghouse dust collected from other smelters around the country and gradually phased out lead smelting operations. Smelting arsenic continued until 1927 (ATSDR, PHA for ASARCO, 1995; CDPHE, The source of anomalous arsenic concentration, 1998.)

Although arsenic was not the commercially dominant product after 1927, the Globe plant processed baghouse dusts with high arsenic concentrations and sold arsenic products. Since 1927, the facility produced cadmium, lead, and thallium along with minor productions of indium, selenium, antimony, zinc, gold, silver, tellurium, and bismuth. According to the Colorado Department of Public Health and the Environment's (CDPHE) report, processing baghouse dust produced significant arsenic concentrations in the smoke emitted from the facility. CDPHE's report states that approximately 17,000 pounds of commercial arsenic trioxide was sold from the Globe facility as late as 1973; and, in 1974, 20,000 pounds of arsenic trioxide was scheduled for shipment to another plant. From the 1980s until approximately 1993, cadmium, thallium, indium, selenium, and lead have been the primary commercial products refined at the facility (CDPHE, The source of anomalous arsenic concentration, 1998.)

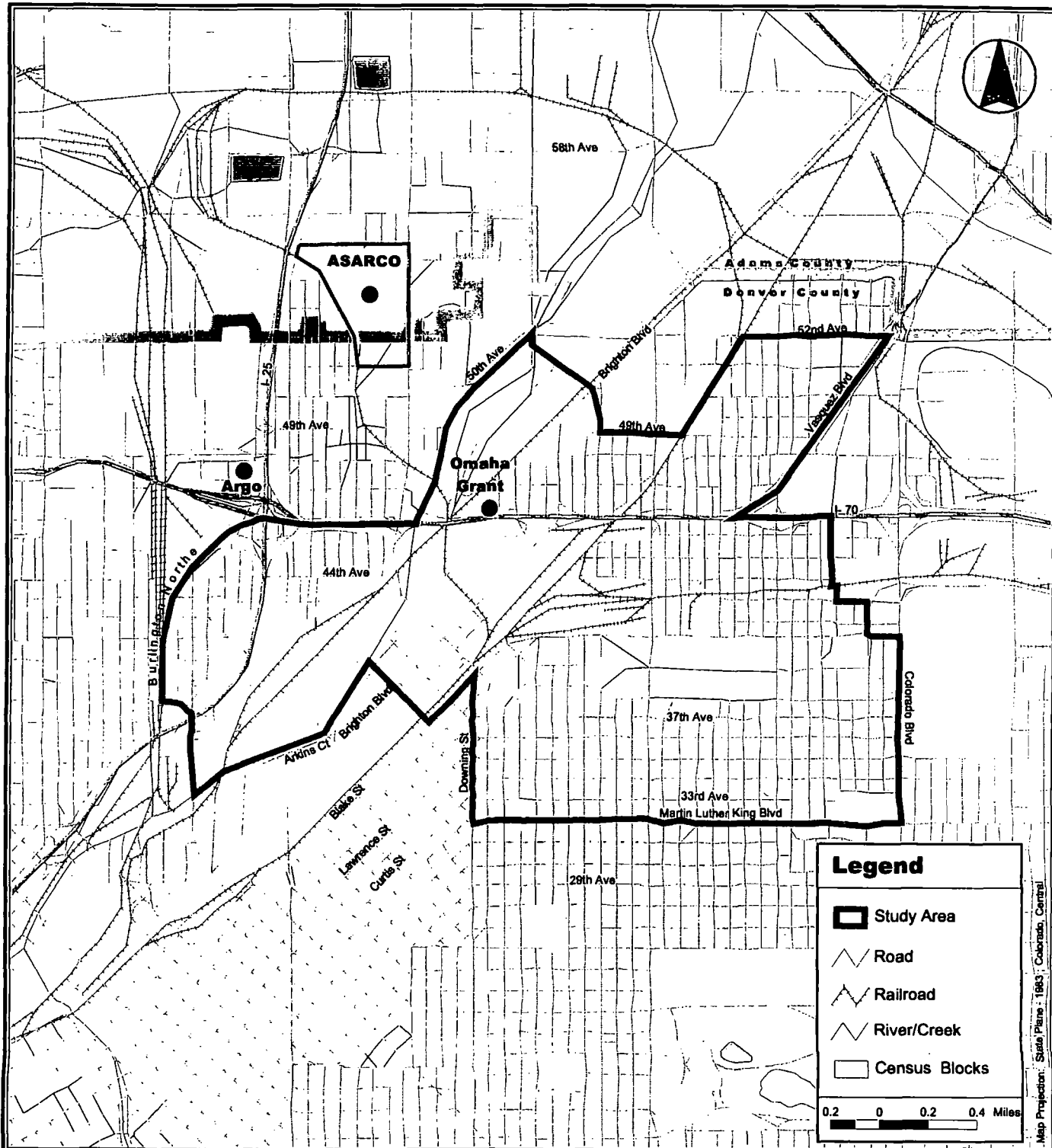
ATSDR Time Line of Activities

Early in its investigation, the VBI70 health team developed a time line of expected activities. During the course of the investigation, certain activities were carried out, some activities were dropped, while other activities are yet to be completed. The activities carried out and the

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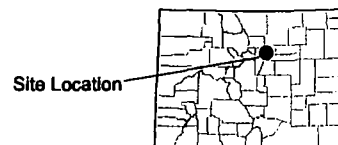


Study Area Boundary Vasquez Boulevard/I-70 Site

Denver, Colorado
CERCLIS No. CO0002259588

VICINITY MAP

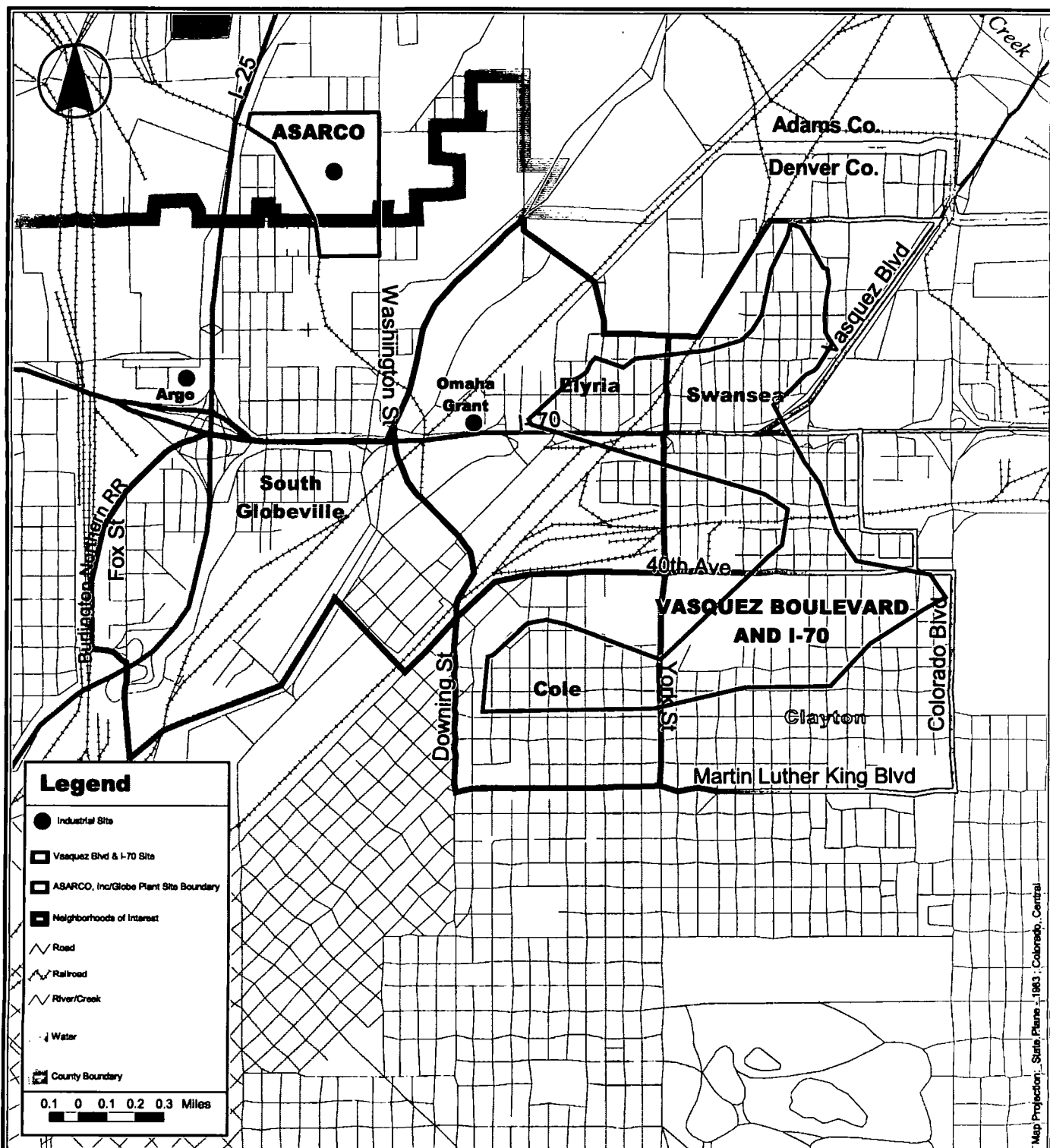
Base Map Source: 1995 TIGER/Line files, U.S. Census



Denver County, Colorado



Figure 1



Study Area Neighborhoods Vasquez Boulevard/I-70 Site

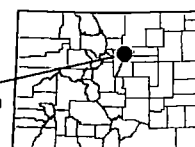
Denver, Colorado

CERCLIS No. CO0002259588

VICINITY MAP

Base Map Source: 1995 TIGER/Line Files,
Neighborhood Boundary Source: Vasquez Boulevard /I-70 Working Group Meeting "Meeting Notes", 11/12/1998

Study Area Location



Denver County, Colorado

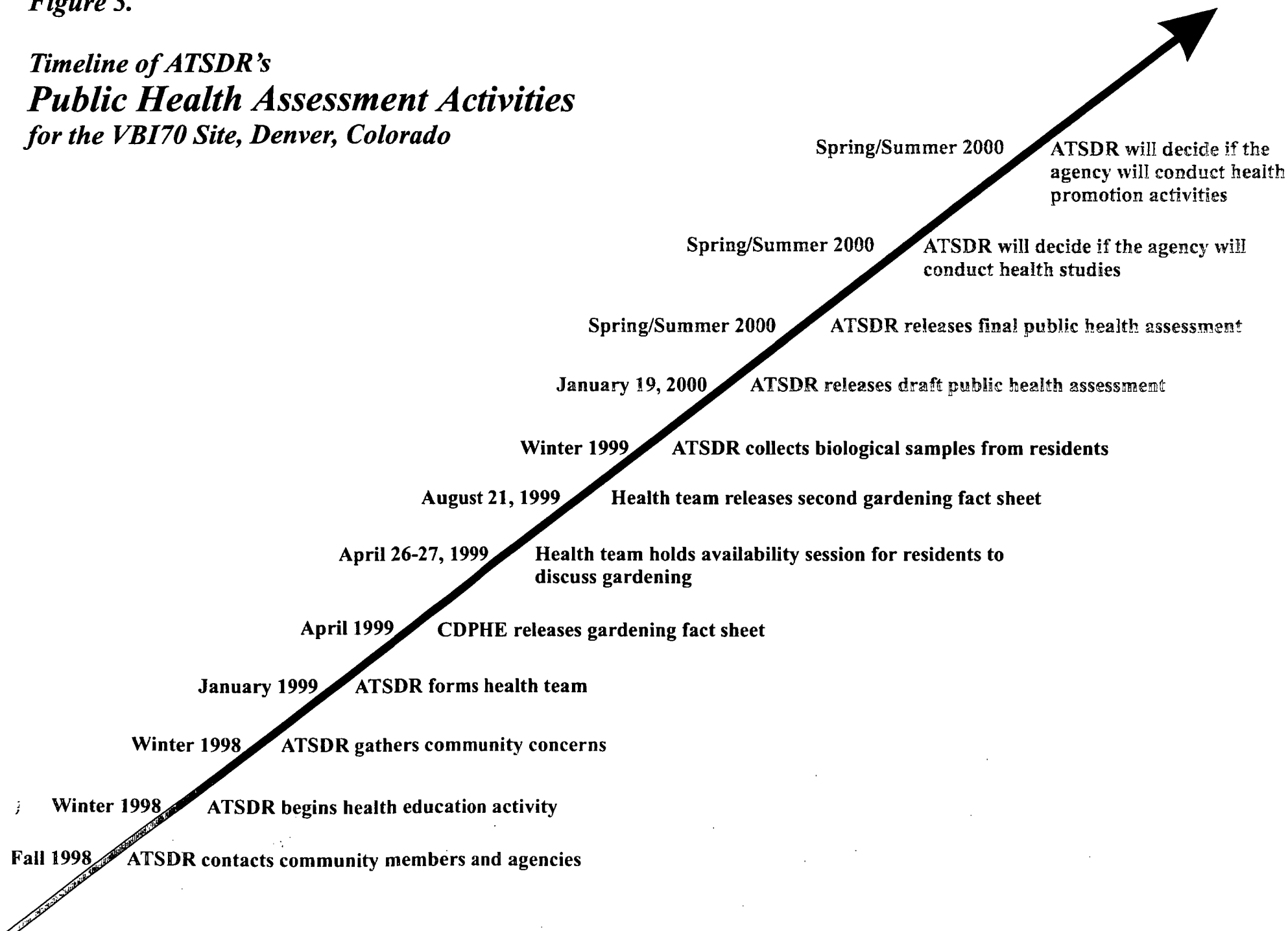


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Figure 2

Figure 3.

***Timeline of ATSDR's
Public Health Assessment Activities
for the VBI70 Site, Denver, Colorado***



expected activities are shown in Figure 3. ATSDR has three broad areas that make up its public health assessment process. The first area is the evaluation of environmental data, concerns, and, if warranted, health outcome data. The results of that evaluation are used to determine the activities in the other two areas: community health education/health promotion, and health studies. This report focuses on the first area, the evaluation of environmental data and community concerns, and part of the second area, health education activities. As decisions are made about the public health significance of contaminants at the VBI70 site, the focus will shift to making decisions about whether or not health promotion activities (for example, health provider education, medical intervention) and health studies are needed.

CDPHE Investigations at VBI70

On July 16, 1997, CDPHE collected 25 soil, 3 surface water, and 3 sediment samples and measured for inorganic metals such as arsenic, cadmium, and lead. Twenty-three soil samples came from Elyria while 2 soil samples came from Swansea. The surface water and sediment samples came from the South Platte River. The results from residential yards showed arsenic levels as high as 1,300 parts of arsenic for every million parts of soil (abbreviated as ppm) and lead levels as high as 660 ppm (Apostolopoulos, 1998; EPA, July 6, 1998a.) Finding elevated levels of arsenic and lead in soil was the reason EPA conducted more extensive soil sampling in the five neighborhoods that eventually became the VBI70 NPL site and the VBI70 study area.

EPA Investigations at VBI70

The EPA has conducted several environmental investigations at the VBI70 site. What follows is a brief description of those investigations that have been completed and some of the planned investigations that are pertinent to ATSDR's public health assessment.

During phase I and phase II investigations in the spring and summer of 1998, the EPA collected on average 2 surface (0-2 inches) soil samples and 1 depth (greater than 6 inches) soil sample from approximately 1,500 properties in the study area. The results showed many properties with elevated levels of arsenic and lead. Twenty-one properties contained average arsenic levels in soil above 450 ppm or average lead levels in soil above 2,000 ppm or both. The EPA received permission from the owners to clean up the soil at 18 of those properties (EPA, July 6, 1998a; EPA September 21, 1998.) At 8 properties in the study area, the EPA also conducted intensive soil sampling, collecting a soil sample every 5 feet (EPA April 1999.) In addition, the EPA also used soil samples from phase I and II sampling rounds to conduct tests to determine the type of arsenic and lead that is present in the soil (EPA undated.)

During phase III sampling, which occurred in the fall of 1999, the EPA collected surface soil samples from approximately 3,000 properties that were not sampled during phases I and II. The EPA altered the sample design for phase III properties to better estimate the average concentration of arsenic and lead. The new sample design consists of collecting 3 composite soil samples from each property with each composite consisting of 10 individual soil samples. The EPA also collected indoor dust samples from some properties (EPA August 4, 1999.)

In addition to soil samples, the EPA fed pigs arsenic-contaminated soil from yards in the study area. The purpose of the study is to determine how much arsenic in soil will be absorbed by pigs. That information can be used to estimate how much arsenic will get into people's body from coming in contact with arsenic-contaminated soil (EPA Sept 1999.)

Demographic Information

Based on 1990 census data, 13,350 people live in the VBI70 study area (see Figure 4.) The racial composition of the area is diverse in that 26% (3,521) of the population is white, 34% (4,492) is black, and about 37% (5031) report a race other than those listed in Figure 4. Persons self-identifying as multiracial, multiethnic, or designating a Spanish/Hispanic origin group to the census question on race are included in the "other race" category.

In response to a separate question on Hispanic origin, approximately 7,000 people in the study area report being of Hispanic origin. Thus, a large percentage of people in the "other race" category are most likely of Hispanic origin. Information on potentially sensitive populations such as young children and older adults, is also presented in Figure 4. The number of children 6 years of age or younger 13% (1,800) of the population while approximately 12% (1,562) of the population is 65 years of age or older. Finally, there are a total of 5,500 housing units located in the study area.

In appendix A, Figure 5 shows population information about the people who live within the boundaries of the VBI70 NPL site, which covers less area than the VBI70 study area. Approximately 5,800 people live in the NPL site boundaries. Figures 6 through 10 in appendix A show the same type of population information for each of the five neighborhoods that are part of the VBI70 study area: Elyria, Swansea, Cole, Clayton, and South Globeville.

Environmental Data and Contaminants of Concern Requiring Further Evaluation

The electronic phase I and II database the EPA provided to ATSDR contained soil measurements on XXXXX properties and consisted of XXXX surface soil samples and XXXX subsurface soil samples. The EPA measured arsenic, lead, and cadmium using an X-ray fluorescent (XRF)

instrument while ten percent of the soil samples were measured using a standard EPA chemical method to validate the X-ray fluorescent measurements.

Arsenic

XRF results from EPA's phase I and II soil samples showed XXXXX properties with detectable levels of arsenic. Of those properties, XXXX had average surface soil levels above 450 ppm arsenic, the level the EPA used as a guide for cleaning up properties immediately. The typical detection limit for the XRF instrument used to measure soil arsenic levels in phase I and phase II was XXXXX. That detection limit is above the typical background level of arsenic in the western United States of 7 ppm (ATSDR 1992.) Therefore, it is not possible to determine the number of properties with background levels of arsenic.

A level of 28 ppm has been cited as the background level for soil arsenic at the adjoining Globeville site (TRC Environmental Consultants, 1992.) However, the 28 ppm level reported for the Globeville site is not reliable because elevated levels of arsenic were detected both on and off the site. In addition, historical smelter emissions in north Denver may have raised background levels. Some uncertainty, therefore, exists whether the 28 ppm arsenic level applies to the Denver area. ATSDR has not located reliable information specifically for Denver nor has the EPA generated a background arsenic soil level specifically for the VBI70 site.

In addition to the EPA data collected specifically for the VBI70, the CDPHE collected 25 soil samples from Elyria and Swansea in July 1997. Of the 25 properties tested, 12 properties have elevated arsenic levels with the highest level being 1,800 ppm (CDPHE).

Lead

EPA's XRF results from phase I and II soil samples showed XXXXX properties with detectable levels of lead. Of those properties, XXXX had average surface soil levels above 2,000 ppm lead, the level the EPA used as a guide for cleaning up properties immediately. The typical detection limit for the instruments used to measure soil lead levels in phase I and phase II was XXXXX. That detection limit is similar to the typical background level of lead in the western United States of 20 ppm (ATSDR 1992.) It is not unusual, however, to find surface soil lead levels of several hundred ppm lead in urban and suburban areas because of lead fallout from the historical use of leaded gasoline and other sources.

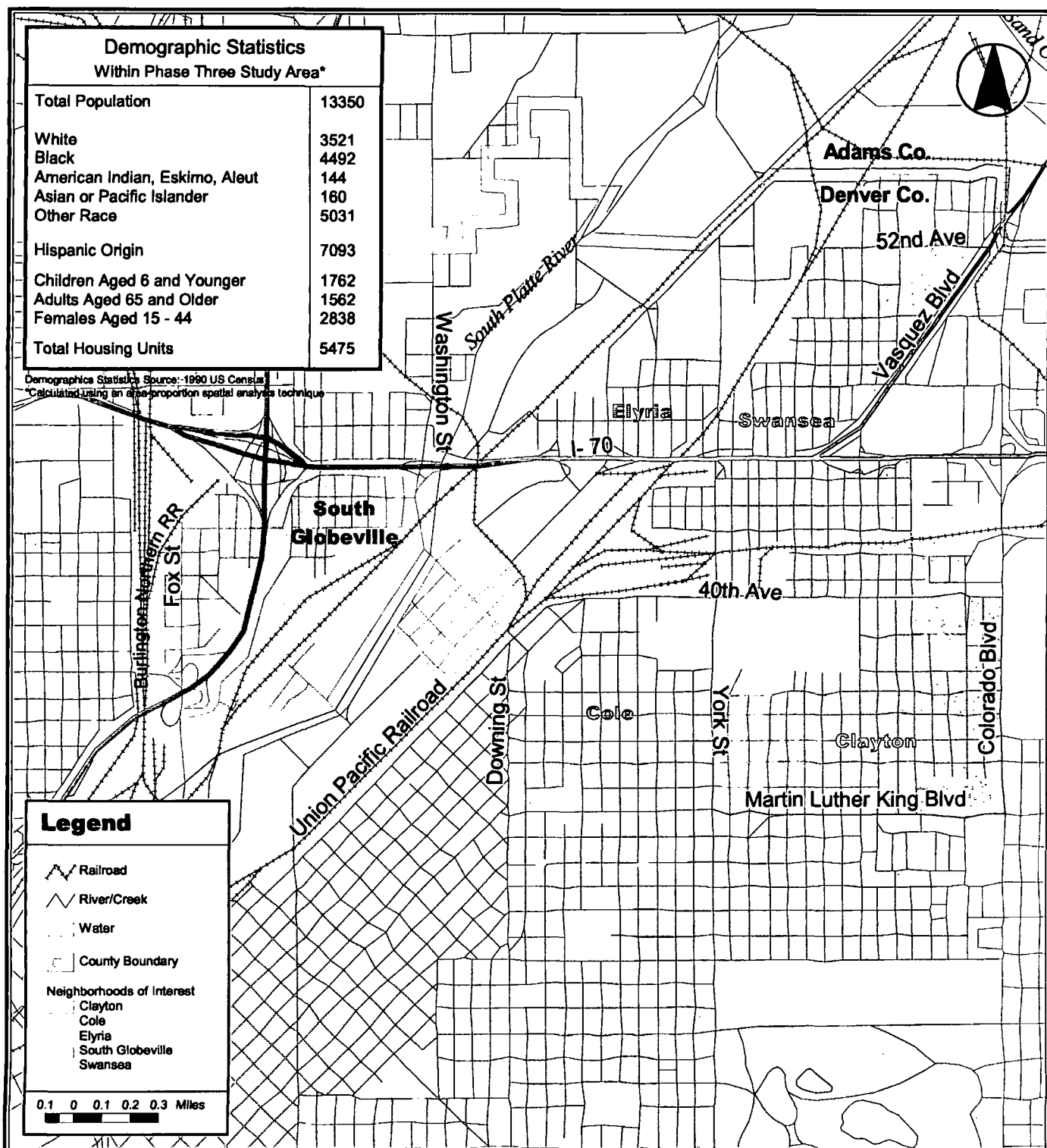
Cadmium

The EPA initially planned to use the XRF instrument to measure cadmium in soil. Since the XRF instrument did not measure cadmium levels accurately and since the detection limit for cadmium

Color Chart(s)

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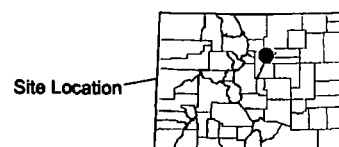
Phase Three Study Boundary **Vasquez Boulevard/I-70 Site**

Denver, Colorado

CERCLIS No. CO0002259588

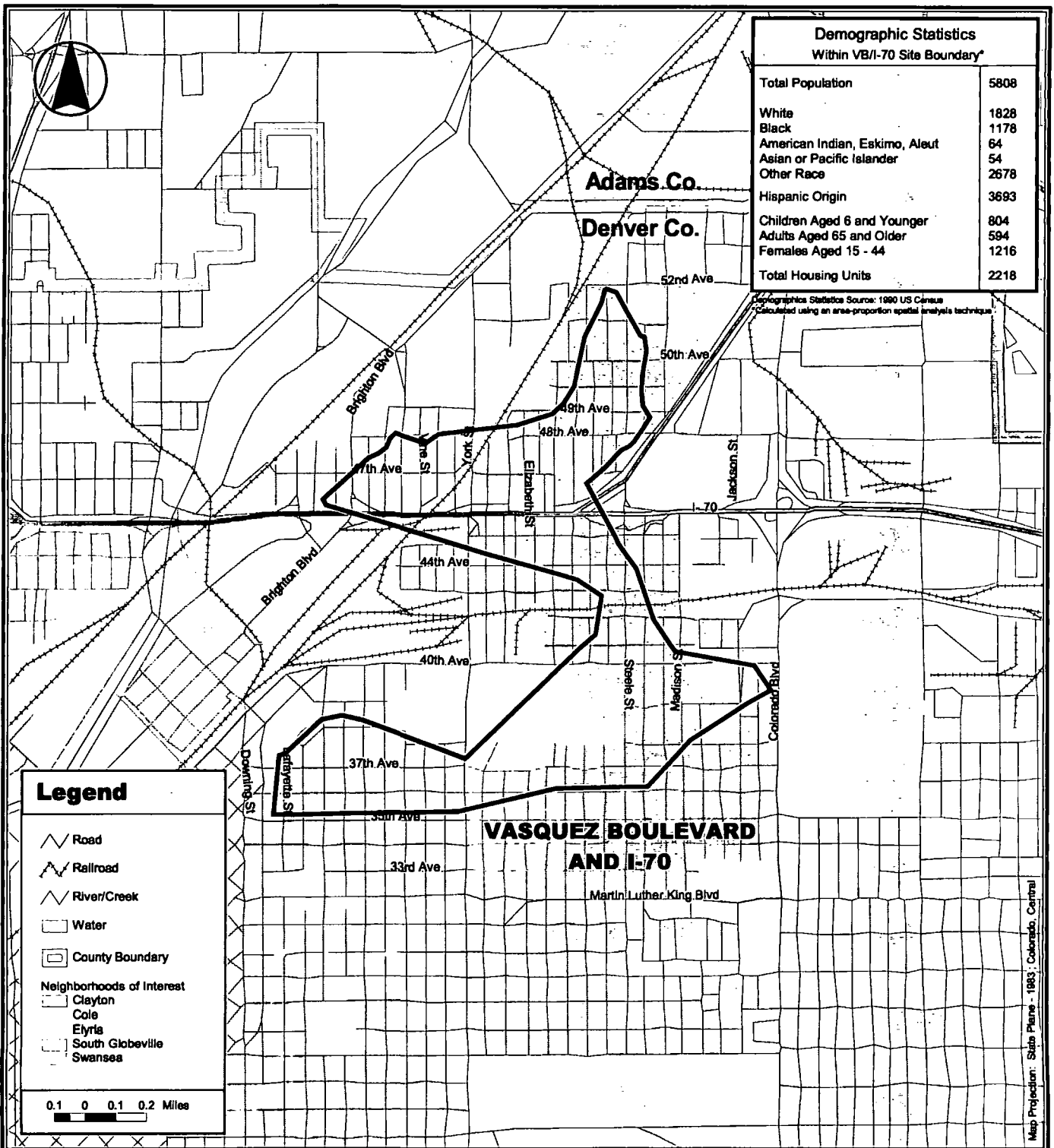
VICINITY MAP

Base Map Source: 1995 TIGER/Line files, U.S. Census



Denver County, Colorado





Vasquez Boulevard/I-70 Site

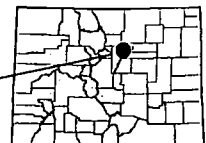
Denver, Colorado

CERCLIS No. CO0002259588

VICINITY MAP

Base Map Source: 1995 TIGER/Line files, U.S. Census

Site Location



Denver County, Colorado



in soil was too high, cadmium measurements were not valid from phase I and II samples. EPA decided not to measure soil cadmium levels in phase III.

However, 363 samples from EPA's Phase I sampling investigation were sent for chemical analysis. Those results show the average cadmium levels from the study area to be 5 ppm in surface soil and 5.6 ppm in subsurface soil. The highest level reported was in subsurface soil at 37 ppm (EPA July 6, 1998b.) The previous levels can be compared to the background level of cadmium in soil of 0.07 to 1.1 ppm (Kabata-Pendias.)

While soil cadmium levels are probably above historical background levels, the levels are not likely to cause harmful effects in people. The estimated amount of exposure in adults and children from contact with soil is below ATSDR's Oral Minimal Risk Level (MRL) for cadmium and below EPA's Chronic Reference Dose (RfD) for cadmium. MRLs and RfDs are health guidelines designed to identify exposure levels in humans below which harmful effects are unlikely. No further evaluation of cadmium toxicity from soil will occur in this health assessment.

Other contaminants of concern

During phase I, EPA collected 44 soil samples for chemical analysis in order to measure the most common metals in soil. Most samples came from Swansea and Elyria. Soil contains many inorganic metals, and it is possible to compare the levels of inorganic metals found in VBI70 soil with expected levels in soil. Except for arsenic, lead, and zinc, the level of inorganic metals in the 44 soil samples from VBI70 was similar to the level of inorganic metals in soil from the western United States. The levels of zinc in surface soil ranged from 84 to 1,600 ppm with an average of 629 ppm while subsurface soil ranged from 84 to 3,300 ppm with an average of 406 ppm. The average level of zinc in western soil is 65 ppm. Zinc was also found at elevated levels in soil at the nearby ASARCO Globe Plant Site.

The level of zinc in soil in the 44 samples are not at levels that would cause harmful effects in people. The estimated amount of exposure to zinc in children and adults from contact with soil is below ATSDR's Oral Minimal Risk Level for zinc and EPA's Chronic Reference Dose for zinc. In addition, zinc is an essential element for humans, and the National Academy of Sciences have recommended that the American diet contain 10 to 15 milligrams of zinc per day.

Thallium was detected in surface soil samples from the study area at an average level of 13 ppm in surface soil and 15 ppm in subsurface soil. Those levels can be compared to the average level of thallium in western US soil of 10 ppm. Neither ATSDR nor EPA has established Minimal Risk Levels or Reference Doses for thallium. The estimated amount of exposure in children and adults from contact with thallium in soil is far below the levels that are known to cause harmful effects. Therefore, thallium will not be evaluated further in this public health assessment.

Adequacy of the environmental data

This subsection will be completed in December

Information from EPA's Regional Geographic Initiative

This subsection will be completed in December.

Review AIRS data

This information is still be gathered and will be completed in December.

Discussion

The discussion section of the public health assessment will describe how people are exposed or might be exposed to contaminants at the VBI70 site and which contaminants people are exposed to. ATSDR will use information gathered from many sources and will explain what situations and human activities that must exist before exposure occurs. Based on the expected amount of exposure to contaminants at the site, ATSDR will describe the harmful health effects that might occur in some people because of their exposure to contaminants. The discussion will cover people who live in the study area where soil and other samples have been collected.

In 1999, ATSDR met with community representatives and residents to learn the questions they have about the site and its contamination. In the discussion that follows, ATSDR will answer those questions. You will also learn about health education activities that took place during the investigation in addition to an introduction to ATSDR's health promotion activities and health studies.

Known (Completed) Exposure Pathways

Soil Ingestion in children and adults

Some yards at the VBI70 site are contaminated with arsenic and lead in soil. Since soil particles can be tracked into houses from foot traffic and from outdoor pets, indoor dust can also become contaminated with arsenic and lead. One of the most important pathways at the VBI70 site that leads to human exposure is accidental ingestion of contaminated soil and house dust by children and adults. As people interact with their environment, for instance when children play outside or crawl around the floor of their house or when adults work in the yard and garden, soil and dust particles cling to their hands. Because people and especially children accidentally put their hands

on or in their mouths, they can swallow small amounts of soil and dust particles. This results in exposure when the soil and dust particles are contaminated with arsenic and lead.

People vary in the amount of soil and dust that they swallow each day. Generally, pre-school children swallow more soil and dust than older children and adults because pre-school children often have closer contact with soil and dust and because they have more frequent hand to mouth activity. Therefore, pre-school children are likely to have the greatest amount of exposure. Exposure, however, still occurs for elementary-age children, teenagers, and adults. This exposure to contaminated soil and dust can occur for decades for those people that live in the VBI70 study area throughout their lives.

The highest amount of exposure to contaminated soil and dust occurs to those families that live in yards with soil containing elevated levels of arsenic and lead. Neighbors who live in uncontaminated yards can be exposed if they visit a house with arsenic- or lead-contaminated soil and house dust. However, that exposure is usually less than the people who live in that house. Most older children and adults in such situations probably have little to no exposure. Pre-school children who visit and play in a contaminated yard or house could be exposed to arsenic- and lead-contaminated soil and house dust. That exposure might approach the exposure for pre-school children who live in a contaminated yard if they frequently (for instance, most of the week) play in the contaminated yard or house. Generally, though, there is little to no exposure from soil and house dust ingestion for neighbors.

A special group of pre-school children exist that purposely swallow large amounts of soil. This behavior is most likely to occur in 1- and 2-year children but can occur at any age, sex, or racial group. The purpose of this behavior is unknown although there is speculation that it has to do with nutritional deficiencies, psychological needs, cultural factors, and medicinal purposes (Danford 1982.) Some uncertainty exists about the number of children that go through this stage of purposefully eating soil. Some human studies on this behavior have reported that 4, 16, 18, and 21 percent of the children observed experienced these high soil intakes (Bartrop 1966; Robischon, 1971; Shellshear 1975; Vermer and Frate 1979.) That means that as many as 21 out of every 100 children might have these very high soil intakes, at least for short periods. One author Dr Edward Calabrese with the University of Massachusetts has estimated as many as 33 percent of pre-school children will have these high soil intakes for some time during their pre-school years (Calabrese and Stanek 1998.)

Another group that might have occasional exposure to arsenic in soil is utility employees that move someone's soil as part of their job. They could be exposed should contaminated soil get on their hands and they have hand to mouth activity.

Eating home-grown produce

Small amounts of inorganic metals occur naturally in soil and will be absorbed by certain garden produce. The US Food and Drug Administration (FDA) periodically surveys garden produce from grocery stores across the US, determines the amount of metals in store-bought food, and estimates the amount of metals that people get in their diets. When garden produce are grown in soil with elevated levels of inorganic metals, some plants may take up certain metals, and people could get additional exposure to those metals from eating home-grown produce.

For the VBI70 site, ATSDR and CDPHE evaluated how much arsenic people might get if the soil in their fruit and vegetable garden was contaminated with arsenic. Using methods described in EPA's risk assessment on biosolids (EPA 1995) and advice from the US Department of Agriculture, ATSDR and CDPHE estimated the amount of exposure people would get if 30% of their produce came from their home garden. ATSDR and CDPHE concluded that the amount of arsenic that people might get from eating home-grown produce is far below the levels that are known to cause harmful effects.

Two significant events occurred during the evaluation of home-grown produce. First, while the health agencies evaluated arsenic exposure from home-grown produce, CDPHE released a fact sheet on home gardening in April 1999 as an interim measure to educate residents. The purpose of the fact sheet was to:

- ✓ provide general information about inorganic metals and uptake in garden produce,
- ✓ explain what residents can do to protect their health when it comes to their garden soil, and
- ✓ explain why they should wash the fruit and vegetables from their gardens.

The fact sheet is provided in appendix B.

The second significant event concerning home-grown produce was the release of the second fact sheet on home gardening once ATSDR and CDPHE completed their health evaluation. The fact sheet, which was released in August 1999, explained that it was safe to eat fruits and vegetables from home garden because

- ✓ only a small amount of arsenic is taken up by some plants,
- ✓ and the amount of arsenic someone would get from eating home-grown produce is little and it will not harm people's health.

The fact sheet released to the public is shown in Appendix C.

Possible (Potential) Exposure Pathways

A human exposure pathway is considered a possible (or potential) pathway when information about the pathway is missing or insufficient. In the cases listed below, the information that is missing or insufficient is environmental data to show whether or not contaminants are present in an area where people live, work, or play.

Sediment and surface water ingestion in children and adults

Children who play in ditches, along streams, and along the South Platte River that border the VBI70 study area could get sediment on their hands and accidentally swallow small amounts from hand to mouth activity. Adults whose work brings them into contact with sediment might also do the same thing.

CDPHE's 1997 investigation collected three sediment samples from the South Platte River: one from where the river crosses underneath I-70 by the Denver Coliseum, one upstream approximately a half mile, and one downstream approximately a half mile (Apostolopoulos 1998.) The level of arsenic, lead, and cadmium in sediment were not elevated, however, three samples are insufficient to determine whether or not sediment is contaminated. The purpose of CDPHE's sampling plan was intended as a screen to prioritize further investigation and can not be used to decide the safety of sediment. From the available environmental data, it is not possible to determine whether or not riverbank sediment and sediment from drainage ditches contain contaminants that might harm children and adults who come in contact with sediment.

CDPHE also collected 3 surface water samples from the same locations in the South Platte River. For exposure to occur, people would have to swim in the South Platte River and accidentally swallow river water. That activity seems unlikely or if it does occur the frequency would be very low. In addition, the amount of water swallowed while swimming would be low to none; therefore, significant exposure to site-related contaminants seems unlikely.

The contaminants of concern at the VBI70 site (arsenic and lead) will not readily cross the skin barrier so wading in the river will not result in exposure.

Another possible exposure that should be considered is when children come into contact with surface water in ditches and drainage streams and puddles following rains. Since metals do not readily cross the skin barrier, direct contact with the skin can be eliminated as a way people can be exposed. Also, it seems unlikely that any significant ingestion of water could occur in this situation. Therefore, it is unlikely that surface water could be a significant route of exposure for people.

Drinking groundwater

Groundwater beneath the site has not been tested, and EPA has stated that it plans to consider groundwater contamination at a later date. The City of Denver uses surface water to provide municipal water to residents in the VBI70 study area. When groundwater data are available, ATSDR will evaluate the public health significance of those data.

Breathing outdoor and indoor air

Residents in the study area can be exposed to arsenic and lead by breathing contaminated soil particles that have been resuspended in outdoor air by wind and automobile traffic. Open doors and windows and air intake vents will lead to contamination of indoor air. Because Denver has a semiarid climate and because the VBI70 area has a great deal of traffic, people living in the VBI70 study area may be more likely to have greater exposure to airborne soil and dust than other areas in the US. The amount of exposure that people in the VBI70 study area might be experiencing is not known at this time because air monitoring data are not available for the VBI70 study area.

Indoor Dust { Another possible way people might be exposed is from air intake vents that are located in crawl spaces beneath a house. If the soil in the crawl space is contaminated with arsenic and lead, it might be possible that contaminated dust will be taken into the air vent and distributed throughout the house. This event would lead to an inhalation exposure when people are indoors. At this time, it is not possible to know if this pathway is occurring because no information exists on whether or not soil in crawl space is contaminated with arsenic and lead nor is there information on indoor air levels of site-related contaminants.

The EPA has not collected indoor or outdoor air samples from the VBI70 study area. EPA will decide after the soil investigation is complete whether or not to investigate air pollution in the study area.

Patterns of arsenic and lead contamination in the VBI70 study area

Scatter grams of contaminant distributions will be presented in this section. That work is still in progress.

The public health significance from exposure to contaminants

Questions from the community

Child Health Initiative

Health Education Activities

Health Promotion Activities

Health Study Activities

Conclusions

Recommendations

Public Health Action Plan

References

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Appendix A

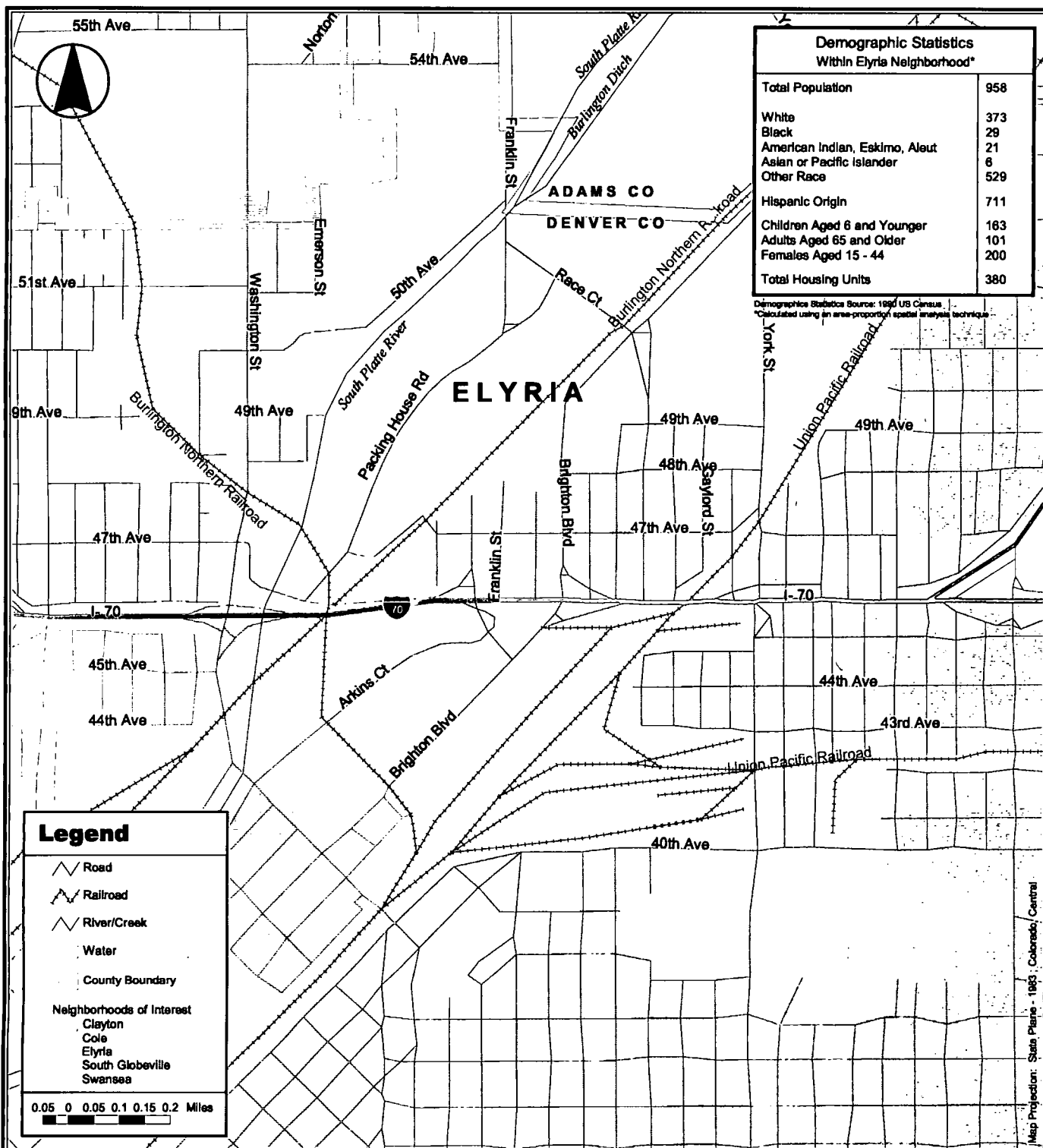
Figures 5 through 10

Information about the people that live in
the VBI70 NPL Site and the five neighborhoods in the VBI70 Study Area

Color Chart(s)

The following pages
contain color that does
not appear in the scanned
images.

To view the actual images,
please contact the
Superfund Records Center
at (303) 312-6473.

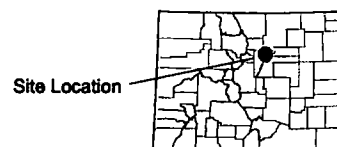


Elyria Neighborhood Vasquez Boulevard/I-70 Site

Denver, Colorado

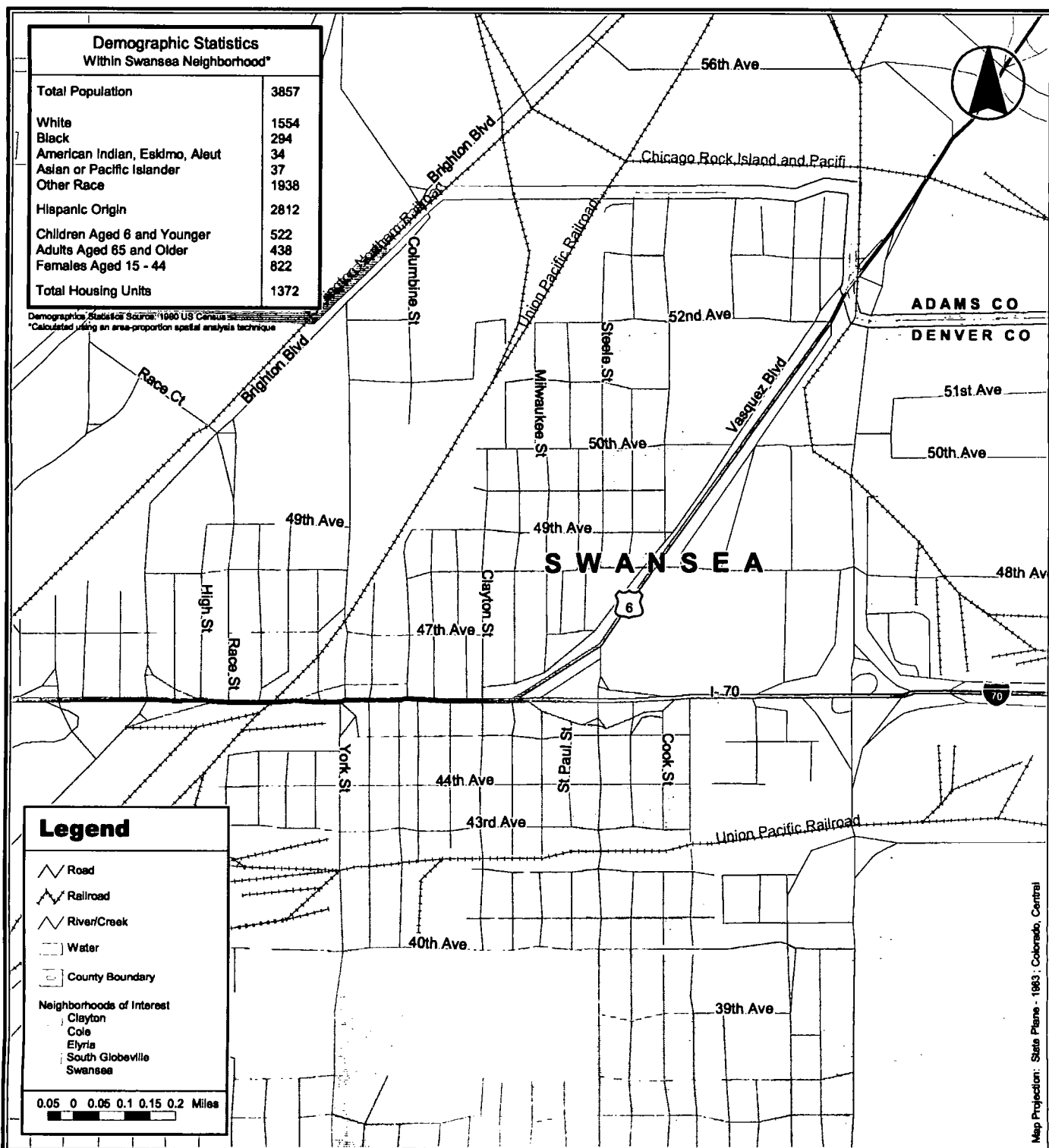
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VICINITY MAP



Denver County, Colorado





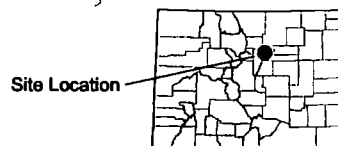
Swansea Neighborhood Vasquez Boulevard/I-70 Site

Denver, Colorado

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VICINITY MAP

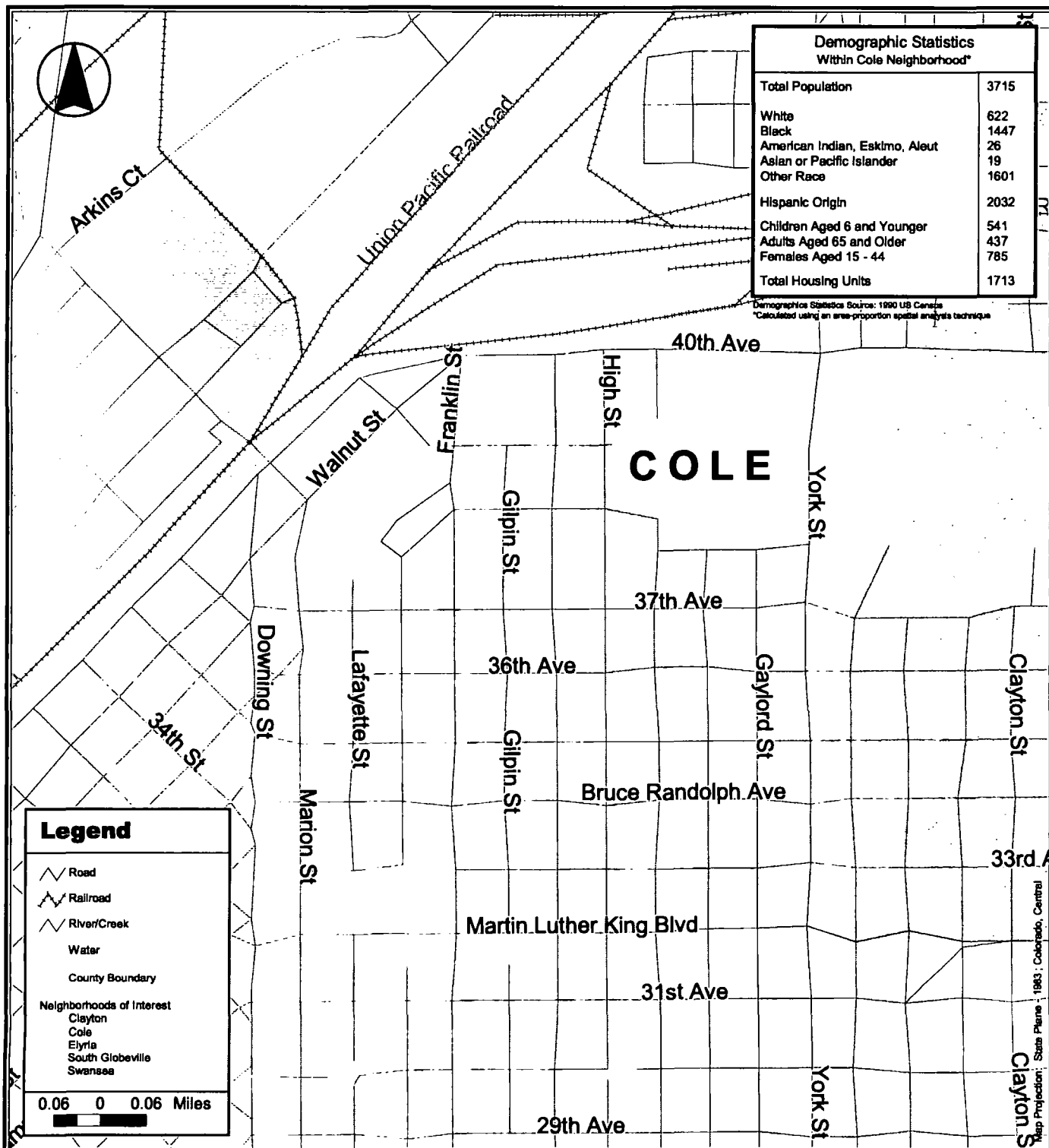
Base Map Source: 1995 TIGER/Line files, U.S. Census



Denver County, Colorado

ATSDR
2002
SAWGIS

Figure 7



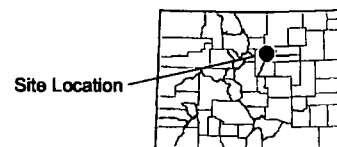
Cole Neighborhood Vasquez Boulevard/I-70 Site

Denver, Colorado

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VICINITY MAP

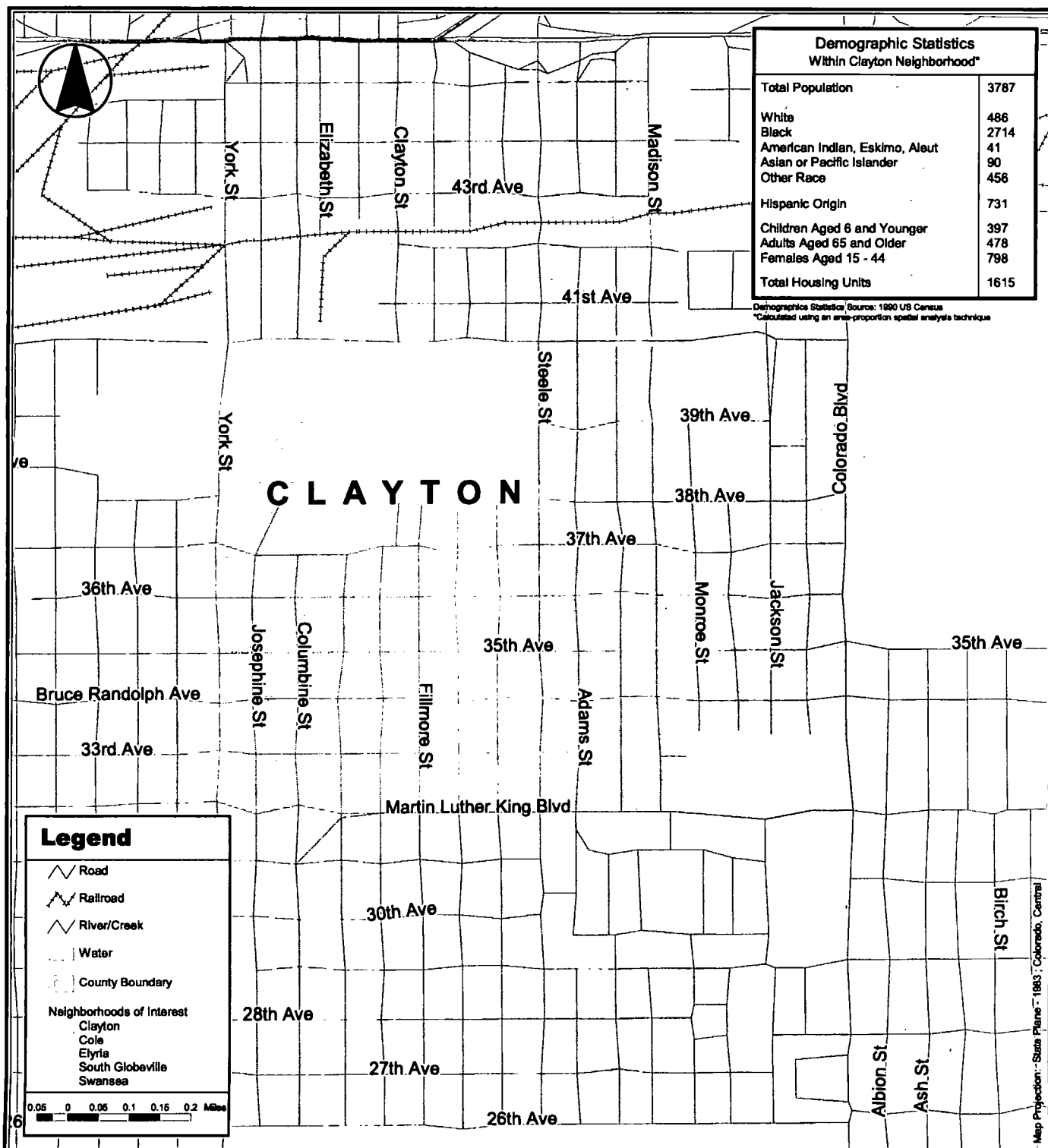
Base Map Source: 1995 TIGER/Line files, U.S. Census



Denver County, Colorado



Figure 8



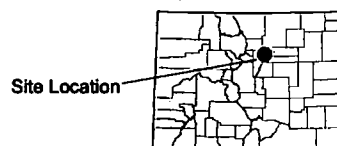
Clayton Neighborhood Vasquez Boulevard/I-70 Site

Denver, Colorado

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VICINITY MAP

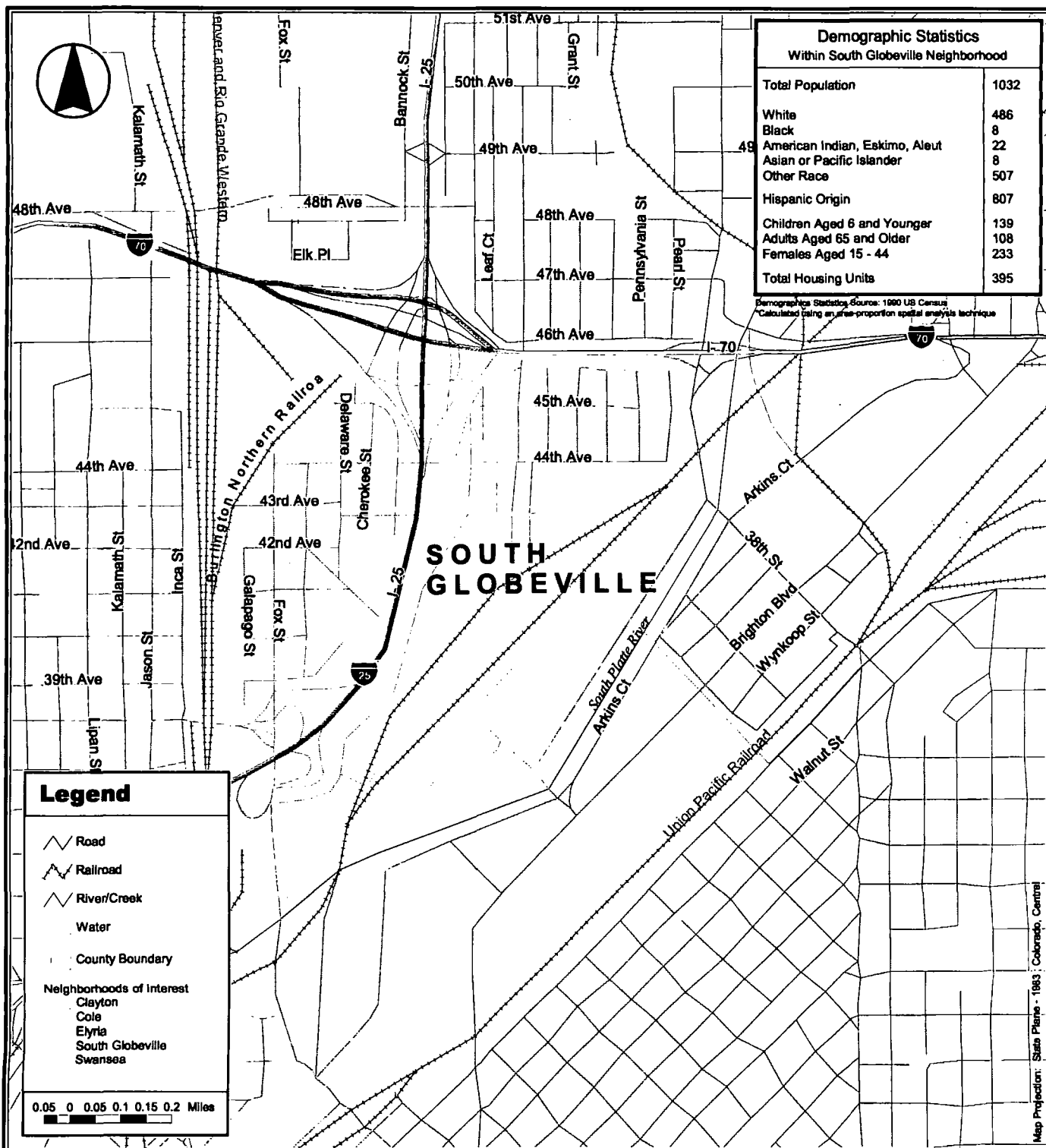
Base Map Source: 1995 TIGER/Line files, U.S. Census



Denver County, Colorado



Figure 9



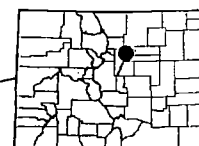
Globeville Neighborhood Vasquez Boulevard/I-70 Site

Denver, Colorado
CERCLIS No. CO0002259588

VICINITY MAP

Base Map Source: 1995 TIGER/Line files, U.S. Census

Site Location



Denver County, Colorado



MAM 10261989

Figure 10

Appendix B

CDPHE's Fact Sheet on Gardening in the VBI70 Study Area



Colorado Department
of Public Health
and Environment

April 1999

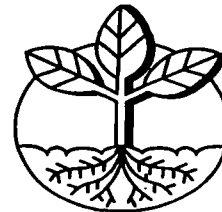
Home Gardening

For the residents of Globeville (south of I-70), Swansea, Elyria, Cole and Clayton neighborhoods

Several public health agencies are studying soil samples in your neighborhood to see if there are any metals present that might pose a health risk. More information will be available from these ongoing studies, and this information may need to be revised.

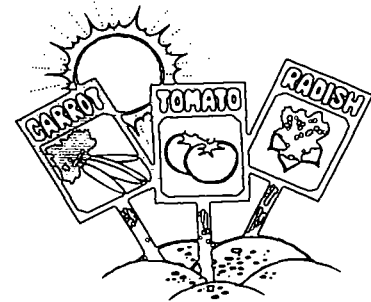
If you decide to garden this season, here is some general information about metals and gardening, and some steps that you can take to reduce the levels of metals that fruits and vegetables grown in your garden may take in if there are metals present in your garden soil.

Metals and gardening



- Garden soils tend to have less metal than the rest of the yard. This is because people have added commercial garden products or materials from outside the area like topsoil and compost to their garden soil.
- Fruits and vegetables from the garden usually have less metal than the soil they are grown in. This is because not all the metal is absorbed by the plants.
- The primary way plants take in metals is from the roots, along with the nutrients plants need for growth. A smaller amount of metals may get into the plant in small particles the plant "breathes" in through leaf openings. Metals may also be present in the dust or soil that collects on the outside of the plant.
- The ability of a plant to take up metals from soil and store them in their leaves and fruits varies from plant to plant.

What can I do to help protect my health?



Your garden soil

- You can add things such as compost, topsoil and phosphate from commercial and other outside sources to your garden soil. These products are available at your local garden store, will enrich your soil, and will help reduce the amount of metals that can be taken up by plants in your garden.
- After gardening be sure to wash up, especially your hands, clothes and shoes, to remove dust and dirt and to avoid tracking soil into your home.

Your fruits and vegetables

- You can eat some fruits and vegetables grown from your garden, and some from the grocery store. This will reduce the possibility of being exposed to metals which may be in your garden soil.
- Wash and peel fruits and vegetables to reduce the amount of dust and dirt on the outside of fruits and vegetables.



You can call the following people at the Colorado Department of Public Health and Environment for more information

For information on garden studies/health effects:

Jane Mitchell

(303) 692-2644 or 1(800)886-7689

jane.mitchell@state.co.us

Nancy Strauss (*habla español*)

(303) 692-2785 or 1(800)886-7689

nancy.strauss@state.co.us

For information on metals in your soil:

Barbara O'Grady

(303) 692-3395 or 1(888)569-1831

barbara.ogrady@state.co.us

Marion Galant

(303) 692-3304 or 1(888)569-1831

marion.galant@state.co.us

For more information about metals in your soil or health effects, you can also call the Agency for Toxic Substances and Disease Registry, Regional Representative Susan Muza at (303) 312-7011.

For more information about gardening in general, you can call the Colorado State University Cooperative Extension Master Gardener at (303) 640-5278.

Prepared by: Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, CO 80246-1530. This fact sheet was supported in whole by funds from the Comprehensive Environmental Response, Compensation, and Liability Act trust fund through a cooperative agreement with the Agency for Toxic Substances and Disease Registry, Public Health Service, US Dept. of Health & Human Services.



Colorado Department
of Public Health
and Environment

abril de 1999

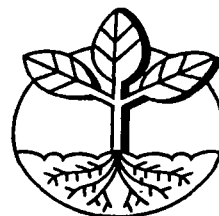
Huertas Residenciales

Para los habitantes de las zonas residenciales de Globeville (al sur de I-70), Swansea, Eyria, Cole y Clayton

Varias agencias de salud pública están estudiando muestras de suelo en su barrio para averiguar si hay algunos metales presentes que podrían representar una amenaza para la salud. Mayor información estará disponible de estos estudios corrientes, y es posible que ésta información sea revisada.

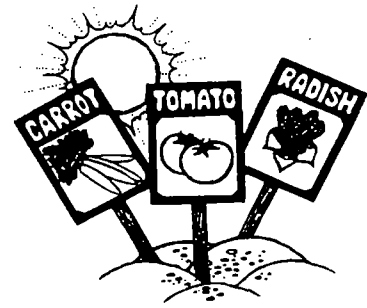
Si usted decide plantar una huerta en ésta temporada, aquí hay algunos datos generales acerca de metales y horticultura, y algunas medidas que usted puede tomar para reducir los niveles de metales que pueden absorber las frutas y vegetales cultivadas en su huerta, si hay metales presentes en el suelo de su huerta.

Metales y horticultura



- Por lo general, los suelos de huertas tiene menos metal que lo demás de la yarda. Ésto es porque personas han aplicado a sus huertas productos comerciales para horticultura o materiales de fuera del área como suelo enriquecido y abono.
- Frutas y verduras de las huertas suelen tener menos metal que el suelo en que se cultivaron. Ésto es porque las plantas no absorben todo el metal del suelo.
- La manera primario que las plantas absorben metales, junto con los nutrientes que necesitan las plantas para crecer es por las raíces. Una cantidad menor de metales puede entrar dentro de la planta en partículas pequeñas que la planta “respira” por entradas en las hojas. También puedan ser presentes metales en el polvo o suelo que colecta en la planta fuera.
- La abilidad de una planta absorber metales del suelo y guardarlos en sus hojas y frutas varían de planta a planta.

¿Qué puedo hacer para ayudar a proteger mi salud?



El suelo de su huerta

- Usted puede aplicar cosas como abono, suelo enriquecido, y fosfato de fuentes comerciales y otras fuentes fuera del área al suelo de su huerta. Estos productos están disponibles en su tienda local de horticultura, enriquezará su suelo, y ayudará a reducir la cantidad de metales que puede entrar a las plantas cultivados en su huerta.
- Después de plantar, asegúrese lavarse bien, sobre todo las manos, la ropa, y los zapatos, para remover el polvo y evitar llevarlo dentro de la casa.

Sus frutas y verduras

- Usted puede comer algunas frutas y verduras cultivado en su huerta, y algunas de la tienda. Ésta reducirá la posibilidad de ser expuesto a metales que puedan estar en el suelo de su huerta.
- Lave y pele frutas y verduras para reducir la cantidad de polvo fuera de las frutas y verduras.



Usted puede llamar a las siguientes personas al Departamento de Salud Pública y Medio Ambiente de Colorado para mayor informes

Acerca de pesquisa de huertas/efectos en la salud:

Jane Mitchell

(303) 692-2644 or 1(800)886-7689

jane.mitchell@state.co.us

Nancy Strauss (*habla español*)

(303) 692-2785 or 1(800)886-7689

nancy.strauss@state.co.us

Acerca de metales en su suelo:

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(303) 692-3395 or 1(888)569-1831

barbara.ogrady@state.co.us

Marion Galant

(303) 692-3304 or 1(888)569-1831

marion.galant@state.co.us

Para más información acerca de metales en su suelo o efectos en la salud, también puede llamar a la Agencia de Sustancias Tóxicas y Registro de Enfermedades, Representante Regional Susan Muza, al (303) 312-7011.

Para más información acerca de horticultura en general, puede llamar al Extension Cooperativo de la Universidad del Estado de Colorado, Maestro Hortelano, al (303) 640-5278.

Preparado por el Departamento de Salud Pública y Medio Ambiente del Estado, 4300 Cherry Creek Drive South, Denver, CO 80246-1530. Ésta hoja informativo fué apoyado en total por fondos del Acto de Respuesta Completo Ambiental, Compensación, y Riesgo por medio de un acuerdo cooperativo con la Agencia de Sustancias Tóxicas y Registro de Enfermedades, E.U. Departamento de Servicios de Salud y Humano.

Appendix C

ATSDR's Fact Sheet Evaluating Gardening in the VBI70 Study Area



Eating Vegetables from your Garden in Swansea, Elyria, Cole, Clayton, & South Globeville

Soil Sampling in your Neighborhood . . .

As you might know, soil from yards in the Vasquez Boulevard and Interstate 70 Superfund Site study area (VBI-70 area) is currently being tested to see if it contains elevated levels of metals such as arsenic and lead. The study area includes the communities of Swansea, Elyria, Cole, Clayton, and south Globeville (south of Interstate 70 and west of Interstate 25). As the sample results become available, several public health agencies are looking at them to see if the metals that are found could cause health problems.

Eating Vegetables from your Garden . . .

The Agency for Toxic Substances and Disease Registry (ATSDR) along with the Colorado Department of Public Health and Environment (CDPHE) just finished an evaluation that looked at fruits and vegetables that are grown in yards where metals are found in the soil. Since arsenic is the metal that has been found most often at elevated levels in the yards that have been sampled so far, the study answered these questions about arsenic:

- ✓ **If elevated levels of arsenic are found in the soil of gardens in the VBI-70 area, is it safe to eat home-grown fruits and vegetables?**

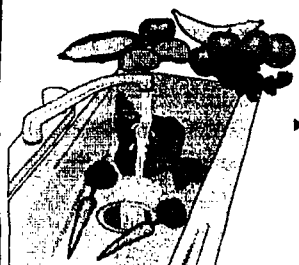
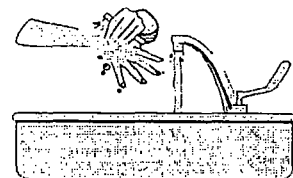
Yes, it is safe to eat fruits and vegetables that are grown in your garden in the VBI-70 area. It is not likely that eating home-grown fruits and vegetables will be harmful.

- ✓ **If there are elevated levels of arsenic in the soil, will arsenic also be found in the fruits and vegetables?**

Fruits and vegetables that are grown in soils with any level of arsenic will take up a small amount of arsenic through their roots. But the amount of arsenic that might be taken into your body from eating these fruits and vegetables is far below the levels that are known to cause illness.

- ✓ **Are there healthy ways to garden?**

Yes, the following tips are healthy practices for all gardeners:



- ▶ Wash your hands after working in the garden and before handling fruits and vegetables.
- ▶ Wash fruits and vegetables, especially low-growing vegetables like collard greens, spinach, and lettuce that are grown in your garden.

For More Information . . .

For more information about gardening and other health studies in your area, you may contact:

David Mellard
ATSDR
1-888-42-ATSDR

Lourdes Rosales-Guevara
ATSDR (Spanish speaking)
1-888-42-ATSDR

Jane Mitchell
CDPHE
(303) 692-2644



¿Come usted frutas y verduras cosechadas en su hortaliza en las colonias de Swansea, Elyria, Cole, Clayton y South Globeville?

Muestreo de los terrenos en su vecindario...

Como usted posiblemente sabe, se están analizando muestras de tierra de los terrenos localizados en el área de estudio del boulevard Vásquez y la autopista 70, para ver si contienen altos niveles de residuos de metales como arsénico, y plomo. Esta área incluye las comunidades de Swansea, Elyria, Cole, Clayton y South Globeville (al sur de la autopista 70). Conforme los resultados vayan saliendo, varias agencias de salud pública los estudiarán para ver si los metales encontrados pueden causar problemas de salud.

Si usted come frutas y verduras cosechados en su hortaliza...

La Agencia de Substancias Tóxicas y Registro de Enfermedades (ATSDR) del gobierno federal, junto con el Departamento de Salud Pública del estado de Colorado han terminado una evaluación de frutas y verduras cosechados en terrenos donde hay metales. El estudio trata de responder las siguientes preguntas acerca de la contaminación por arsénico, ya que éste ha sido el metal encontrado en mayor abundancia hasta ahora.

- ✓ ¿Si encuentran altos niveles de arsénico en la tierra, sería prudente comer frutas y verduras cosechadas en los terrenos del boulevard Vásquez?

Sí es seguro comer frutas y verduras cosechadas en las hortalizas del boulevard Vásquez. No es probable que comerse las frutas y verduras de esos terrenos les hagan daño a la salud debido a la presencia del arsénico.

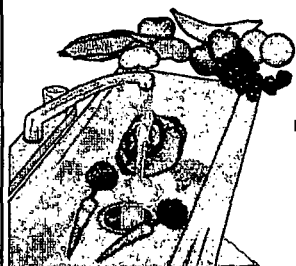
- ✓ ¿Por qué no es probable que comer frutas y verduras de esos terrenos haga daño a la salud si tienen altos niveles de arsénico?

Porque las frutas y verduras cosechados en terrenos contaminados con cualquier nivel de arsénico absorben muy poca cantidad de este metal a través de sus raíces. Asimismo, la cantidad de arsénico que podría entrar en su cuerpo comiendo estas frutas y verduras es inferior a los niveles que pueden causar enfermedad.

- ✓ ¿Hay alguna posibilidad de trabajar en el jardín sin riesgo para la salud?



Por supuesto, las siguientes recomendaciones le permitirán trabajar el jardín sin **que le afecte su salud:**



- ▶ Lávese bien las manos después de haber trabajado en su terreno y antes de preparar las frutas y verduras que vaya a comer.
- ▶ Lave bien las frutas y verduras antes de comérselas, sobre todo las que crecen mas cerca de la tierra como son las espinacas y las lechugas.

Si desea más información...

Si desea más información acerca de las investigaciones de salud relacionadas con la cosecha de frutas y verduras en su localidad, llame a:

David Mellard
ATSDR
1-888-42-ATSDR

Lourdes Rosales-Guevara
ATSDR (Habla español)
1-888-42-ATSDR

Jane Mitchell
CDPHE
(303) 692-2644